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Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Plants

Comment On: NRC-2021-0179-0001
Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors

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General Comment

Entergy appreciates the opportunity to provide comments on the subject draft Regulatory Guide. See attached file(s)

Attachments

ETR comments on DG-1389

Section	Comment	Proposed Resolution
Section 1.3.5	In the original implementation of the alternative source term, the EQ impacts of a simple conversion to the AST with no additional changes or relaxations was evaluated as part of the re-baselining work. The Sandia evaluation in ML20154G363 determined the AST airborne EQ doses were lower than those based on TID-14844 while the pool doses were addressed and dispositioned under Generic Issue 187. Section 1.3.5 indicates that the EQ analyses may only be affected by proposed plant modifications; however, no additional benchmarking on plant impacts appears to have been performed to support this DG. Considering the significant changes to the timing and release fractions, are the EQ-related conclusions from the original AST effort still applicable?	Confirm applicability of original AST conclusion on EQ.
Section 3.2 Table 1	The halogen component of the BWR core release fractions have nearly doubled from those the Revision 0. The SAND2011-0128 report provides no details on why the BWR halogen releases increased so dramatically while the PWR releases decreased. The small burnup extension considered in these updated analyses would not be expected to lead to such a large difference for just one plant type. As the operator of two large BWRs, these higher release fractions will make it difficult to apply this new Reg Guide considering the current margins to the regulatory acceptance criteria.	Provide the basis for the significant increase in the BWR halogen release fractions in Table 1.
Section 3.2 Tables 1, 2, and 6	Tables 1 and 2 report release fractions from a new Molybdenum group; however, the elements in this new group are not listed in Table 6. Which release group is Zirconium (Zr) considered to reside? DG-1389 is consistent with Rev. 0 and indicates it is part of the Lanthanides while Table 14 in the underlying Sandia report (SAND 2011-0128) reports Zirconium as part of the Cerium group.	It is expected that the final grouping is consistent with SAND-2011-0128 since that is the basis for the release fractions in Tables 1 & 2. Update the Table 6 for the new proposed Molybdenum group. Change Zr grouping to Cerium group.

Section	Comment	Proposed Resolution
Section 3.3 Table 5	The reported onset time of the early in-vessel release phase for BWRs is listed as 0.16 hours. This value does not appear to include the delay from the BWR coolant release phase of 2 minutes. If the gap release begins at 2 minutes and lasts 0.16 hours in duration, the onset time of the early in-vessel release phase would be 0.193 hours if it occurred consecutively after the gap release phase as the text indicates. However, Table 5 reports 0.16 hours as the onset time implying the early in-vessel phase begins before the gap release phase ends.	To accurately consider the 2-minute coolant release phase, the reported onset time of the early in-vessel release phase for BWRs should be updated to 0.193 hours.
Section 5.1.1	The inputs to the design basis analysis are numerous and although each of these inputs would have a distribution of applicable values, this DG typically requires values that represent the worst-case (*i.e.,* generally 5^{th} or 10^{th} percentile of the distribution). This conservatism in the inputs is compounded in the evaluation process and leads to an extremely conservative result. As currently performed for 50.46 LOCA analyses, the required reasonable assurance in 10CFR 50.67 may be provided with a statistical analysis based on probability distributions that have been rigorously developed from the underlying data. This change in methodology would likely require additional NRC review.	Confirm that the caution proposed for deviating from the standard methodology does not preclude statistical approaches to assessing the dose consequences.
Section 5.3	DG-1389 states that the control room methodology in RG 1.194 may be used to estimate the offsite X/Q out to distances of 1,200 m. This is a new position and the basis for this appears to be DG-4030; however, the associated Reg Guide 1.249 has not been released.	Reference the basis for this new position
Section A-2.2	Aerosol deposition using the NUREG/CR-6189 methods are credited at some Entergy plants. Section 6.5.2 of DG-1389 indicates that NUREG/CR-6189 continues to be acceptable for removal of iodine and aerosols. However, based on Section 1 of NUREG/CR-6189, the models are based on the release fractions and timing in NUREG-1465. Considering the significant changes to the release fractions and timings in DG-1389, there may be significant impacts to the deposition rates in this NUREG.	Confirm the continued applicability of the NUREG/CR-6189 aerosol removal rates.

Section	Comment	Proposed Resolution
Section A-2.7	Section 3.7 of Appendix A to Reg Guide 1.183 Rev. 0 contained a paragraph providing specific guidance regarding mixing in Mark III containments, including uniform mixing between the drywell and containment after 2 hours. This paragraph has been deleted in the proposed revision. Entergy operates 2 BWR/6 plants with Mark-III containments that credit the mixing guidance from Revision 0. In the absence of any guidance, what is an acceptable approach to mixing in Mark-III containments? Are the previous Mark III mixing assumptions still acceptable for amendments prepared under the proposed revision? Is the 2-hour timing for uniform mixing from Rev. 0 still applicable considering the new release timing in Table 5? With the new MHA-LOCA scenario, should drywell-wetwell/containment mixing even need to be considered?	NRC should confirm the continued applicability of the previous guidance or provide alternate guidance.
Section A-3.5	The DG indicates that aerosol deposition may be considered in bypass pathways. However, plate-out of elemental iodine may also be a significant removal mechanism in gas-filled secondary bypass leakage pathways. In addition to aerosol deposition, the plate-out of elemental iodine should not be excluded.	Add statement allowing iodine plate-out.
Section B-1.3	The DG states that the chemical form of radioiodine released from the fuel to the spent fuel pool should be assumed to be 95-percent cesium iodide (CsI), 4.85-percent elemental iodine, and 0.15-percent organic iodide. While DG-1389 only reports the iodine species distribution released into the pool, Reg Guide 1.183 Rev. 0 reported that the iodine chemical species above the water is 57% elemental and 43% organic. For Rev. 1 applications, what iodine species distribution should be applied for the early 2-hour airborne release considering the new fuel handling accident model? Based on the calculated overall pool DF from Equations 3-1, 3-2, and 3-3, is a species-dependent DF approach acceptable with organic iodine having a DF of 1? Is a purely elemental iodine species appropriate for the long-term release since this is comprised of re-evolved elemental iodine?	Provide additional guidance on acceptable airborne iodine species assumptions.

Section	Comment	Proposed Resolution
Section B-1.3	For the fuel handling accident, DG-1389 indicates that the fission product release from the breached fuel is based on the non-LOCA gap fractions in Regulatory Position 3.2; however, the NRC's assessment in the Staff's example in ML21190A040 appears to apply a much larger value of 23% for Iodine-129 which is significantly higher than the 4% from Table 4 for "other halogens".	Confirm the applicability of Tables 3 and 4 for the "other halogens" for application in the fuel handling accident.
Section B-2	Section B-2 states that the decontamination factor (DF) can be calculated from Equations in B-1, B-2, and B-3, if the water depth is between 19 and 23 feet. There is no guidance in the event the water depth is greater than 23 feet. Some Entergy plants consider drops over the core where there is significantly greater than 23 feet of water coverage. The proposed DF model would be expected to be valid for these larger water depths.	The Reg Guide should allow the application of the DF equations in Appendix B-2 for water depths greater than 23 feet. Since these equations are not directly dependent on depth, it would be expected that they would yield a conservatively low DF than an actual value for cases that credit the additional scrubbing depth.